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WARZYN

PROJECT
1526892

VOLUME IIIa OF III

PLANNING DOCUMENTS
QUALITY ASSURANCE PROJECT PLAN
FINAL

REMEDIAL INVESTIGATION/ FEASIBILITY STUDY

BELOIT CORPORATION
ROCKTON FACILITY
ROCKTON, ILLNOIS

MAY 1994

PREPARED FOR:
BELOIT CORPORATION
ROCKTON, ILLINOIS

...

PREPARED BY:
WARZYN INC.
MADISON, WISCONSIN

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Kevin J. Domack
Project Manager

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Environmental Chemist

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MAY 1994

APPROVALS:	DATE:
Beloit Corp. Site Project Manager	
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Illinois EPA, Quality Assurance Officer	
Illinois EPA, Remedial Project Manager	
Warzyn Quality Assurance Officer	
Enseco Quality Assurance Officer	
RMT Quality Assurance Officer	

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LIST OF ACRONYMS AND ABBREVIATIONS

AOC	Administrative Order on Consent
ARAR	Applicable or Relevant and Appropriate Requirement
ASTM	American Standards for Testing Materials
CDO	Central District Office
CLP	Contract Laboratory Program
CRDL	Contract Required Detection Limits
CRQL	Contract Required Quantitation Limits
CRL	Central Regional Laboratory
DL	Detection Limit
DQO	Data Quality Objective
ENSECO	Enseco Rocky Mountain Analytical Laboratory
ESI	Expanded Site Inspection
FIT	Field Investigation Team
FSP	Field Sampling Plan
GC	Gas Chromatograph
HRS	Hazard Ranking System
HSP	Site-Specific Health and Safety Plan
ICP	Inductively Coupled Plasma Spectrometer
IDL	Instrument Detection Limit
IEPA	Illinois Environmental Protection Agency
MS/MSD	Matrix Spike/Matrix Spike Duplicate
NPL	National Priorities List
PA	Preliminary Assessment
PRP	Potentially Responsible Party
QA	Quality Assurance
QAO	Quality Assurance Officer
QAPP	Quality Assurance Project Plan
QAS	Quality Assurance Section
QC	Quality Control
R&D Center	Research & Development Center
%R	Percent Recovery
RI/FS	Remedial Investigation/Feasibility Study
RPD	Relative Percent Difference
RPM	Remedial Project Manager
SER	Site Evaluation Report

Site	Beloit Corporation, Rockton Facility
SOP	Standard Operating Procedure
SOW	Statement of Work
TAL	Target Analyte List
TDS	Total Dissolved Solids
TCL	Target Compound List
TIC	Tentatively Identified Compound
TOC	Total Organic Carbon
U.S. EPA	United States Environmental Protection Agency, Region V
VOA	Volatile Organic Analysis
Warzyn	Warzyn Inc.

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INTRODUCTION

The United States Environmental Protection Agency (U.S. EPA) requires that all environmental monitoring and measurement efforts mandated or supported by U.S. EPA participate in a centrally managed quality assurance (QA) program.

Any party generating data under this program has the responsibility to implement minimum procedures to assure that precision, accuracy, completeness, and representativeness of its data are known and documented. To ensure the responsibility is met uniformly, each party must prepare a written QA Project Plan (QAPP) covering each project it is to perform.

This QAPP presents the organization, objectives, functional activities, and specific Quality Assurance (QA) and Quality Control (QC) activities associated with Phase II of the Remedial Investigation/Feasibility Study (RI/FS) for the Beloit Corporation Rockton Facility Site. This QAPP also describes the specific protocols which will be followed for sampling, sample handling and storage, chain-of-custody, and laboratory and field analysis.

This QAPP has been updated to provide necessary changes to the approved 1992 QAPP for laboratory changes and additional field screening of soil samples by field GC. The number and type of samples collected is also modified to reflect the Phase II Work Plan.

At the request of the Illinois EPA, method detection limits for organic analysis will be provided for use in Baseline Risk Assessment Calculation. This involved changing organic CLP Laboratory to Enseco Laboratories. At this time Beloit Corp. has elected to have Enseco perform all organic, inorganic, and indicator analyses. Because Enseco is approved for CLP analysis by the U.S. EPA Region V QAS, this change will not affect the comparability of data between phases of this project.

All QA/QC procedures will be in accordance with applicable professional technical standards, U.S. EPA requirements, government regulations and guidelines, and specific project goals and requirements. This QAPP is prepared by Warzyn Inc. (Warzyn) in accordance with the U.S. EPA QAPP guidance documents:

- U.S. EPA, December 1980, Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans, QAMS-005/80.

- U.S. EPA, May 1991, Region V Model Superfund Quality Assurance Project Plan.

- U.S. EPA, January 1989, Region V Content Requirements for Quality Assurance Project Plan.

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PROJECT DESCRIPTION

1.1 SITE HISTORY AND BACKGROUND INFORMATION

The Beloit Corporation Rockton Facility (site) is located in Rockton Township, in north-central Illinois. The site lies in a mixed industrial and residential area approximately 3/4 mile north of the City of Rockton. The site occupies part of the northern half of Section 13 and the southeast quadrant of Section 12, T46N, R1E, Winnebago County, Illinois.

The RI/FS boundary, as identified by the Illinois Environmental Protection Agency (IEPA), includes Beloit Corporation property, the neighboring Blackhawk Acres Subdivision and United Recovery Property. The site is bounded on the north by Prairie Hill Road, on the west by the Rock River, on the south by a line projected along a Beloit Corporation access road from Blackhawk Boulevard to the Rock River, and on the east by Blackhawk Boulevard.

The Beloit Corporation, a subsidiary of Harnischfeger Industries, is a manufacturer of machines that produce layered paper products from paper pulp. Site features located on the Beloit Corporation property include the plant, a research and development center (R&D Center), wastewater treatment facility, a foundry sand disposal area, fibrous sludge spreading area, gravel pit and storage areas. Additional buildings located on the site include United Recovery, Safe-T-Way, and homes in the Blackhawk Acres Subdivision.

1.2 PAST DATA COLLECTION ACTIVITY/CURRENT STATUS

The site was officially entered on the National Priorities List (NPL) on August 30, 1990, with a hazard Ranking Score of 52.08.

The site has been subject of a number of investigations since 1980. A discussion of the investigations is provided in the Site Evaluation Report (SER) (Warzyn, 1991).

Activities performed in Phase I of the RI/FS Investigation are described in the June 1992 Work Plan. The results of the Phase I investigation are described in Technical Memorandum I (Warzyn, June 1993).

1.3 PROJECT OBJECTIVES AND SCOPE

The purpose of the RI is to gather sufficient information to quantify risk to public health and environment (Baseline Risk Assessment) and to develop and evaluate viable remedial alternatives (Feasibility Study) at the site. The objectives of the RI are to determine the nature and extent of contamination at the site in order to support the activities of the FS. The objective of the RI/FS is to develop and evaluate appropriate remedial action alternatives based on the RI/FS data.

The primary remedial objectives of the data collection are as follows:

- Acquire data necessary to determine potential contaminant migration pathways and transport rates
- Collect sufficient data on all contaminated media to support the baseline risk assessment and feasibility study
- Further define the nature and extent of groundwater contamination, as well as identify potential source(s) of the contamination
- Further define the nature and extent of on site soil contamination
- Determine background groundwater and soil quality

All tasks, subtasks and activities are directed toward the accomplishment of these primary objectives. Refer to the Work Plan for a detailed description of the RI tasks, subtasks and activities.

1.4 SAMPLE NETWORK DESIGN AND RATIONALE

The sample network design and rationale for sample locations is described in detail in Section 2 of the Phase 2 Work Plan Addendum.

1.5 PARAMETERS TO BE TESTED AND FREQUENCY

Sample matrices, analytical parameters, and frequencies of sample collection can be found in Table 1-1. A summary of sample volume, bottle, preservative, and packaging requirements is provided in Table 1-2.

1.6 INTENDED DATA USAGE AND DATA QUALITY OBJECTIVES

Data Quality Objectives (DQOs) are qualitative and quantitative statements which specify the quality of the data required to support decisions made during the RI/FS activities, and are based on the end uses of the data to be collected. As such, different data uses may require different levels of data quality. There are five analytical levels which address various data uses and the QA/QC effort and methods required to achieve the desired level of quality. These levels are:

- Screening (DQO Level 1): This provides the lowest data quality but the the most rapid results. It is often used for health and safety monitoring at the site, preliminary comparison to Applicable or Relevant and Appropriate Requirements (ARARs), initial site characterization to locate areas for subsequent and more accurate analyses, and for engineering screening of alternatives (bench-scale tests). For the site, data generated under DQO Level 1 are for health and safety monitoring. Health and Safety Monitoring activities are described in the Site-Specific Health and Safety Plan (HSP) and are not covered in this QAPP.

- Field Analyses (DQO Level 2): This provides rapid results and better quality than in Level 1. This level may include mobile laboratory generated data depending on the level of quality control exercised. For the site, data generated under DQO Level 2 are: the determination of pH, conductivity, temperature, and water level measurements in groundwater. In addition, soil gas and groundwater VOC data generated by field GC are considered DQO Level 2.

- Engineering (DQO Level 3): This provides an intermediate level of data quality and is used for site characterization. Engineering analyses may include mobile laboratory generated data and some analytical laboratory methods (e.g., laboratory data with quick turnaround for screening, but without full quality control documentation, or confirmed identification and quantification data, with built-in QA/QC, including calibration runs, surrogate standards, etc., and external QA/QC such as duplicate samples, field blanks, etc.). For the site, data generated under DQO Level 3 are the physical characterization of soils for hydraulic conductivity, total organic carbon and grain size distribution, and the indicator parameters (alkalinity, chloride, sulfate, total dissolved solids (TDS), nitrate and nitrite nitrogen, ammonia nitrogen, and total phenolics) for groundwater samples.

- Confirmational (DQO Level 4): This provides the highest level of data quality and is used for purposes of risk assessment, evaluation of remedial alternatives, and Potentially Responsible Party (PRP) determination. These analyses require full Contract Laboratory Program (CLP) analytical and data validation procedures in accordance with U.S. EPA recognized protocol. For the site, data generated under DQO Level 4 are the Target Compound List (TCL) organic and Target Analyte List (TAL) inorganic parameters for groundwater and soil matrices.

- Non-Standard (DQO Level 5): This refers to analyses by non-standard protocols, for example, when exacting detection limits or analysis of an unusual chemical compound is required. These analyses often require method development or adaptation. The level of quality control is usually similar to DQO Level 4 data. These analyses require full CLP analytical and data validation procedures in accordance with U.S. EPA recognized protocol. DQO Level 5 data is not anticipated for the site.

A summary of data generating activities, intended data uses and associated DQOs for the site are presented in Table 1-3.

1.7 PROJECT SCHEDULE

A schedule of RI/FS activities for the site is presented in the Phase 2 Remedial Investigation Addendum No. 1 Work Plan.

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PROJECT ORGANIZATION AND RESPONSIBILITY

At the direction of the IEPA and the Beloit Corporation, Warzyn will be conducting all phases of the RI/FS. Warzyn will perform the field investigation, prepare the RI report, and perform the subsequent FS. Project management will also be provided by Warzyn, under the direction of the Beloit Corporation. The various quality assurance and management responsibilities of key project personnel are defined below. Refer to Figure 2-1 for the project organizational chart.

2.1 OVERALL RESPONSIBILITY

Illinois EPA Remedial Project Manager
The IEPA Remedial Project Manager (RPM) is Mr. Eric D. Runkel. The RPM has the overall responsibility for all phases of the RI/FS.

Beloit Corporation Site Project Manager
The Beloit Corporation Site Project Manager is Mr. Mike Radcliffe. The Site Project Manager is responsible for implementing the project, and has the authority to commit the resources necessary to meet project objectives and requirements. The Site Project Manager's primary function is to ensure that technical, financial, and scheduling objectives are achieved successfully. He will report directly to the IEPA RPM and will provide the major point of contact and control for matters concerning the project.

Warzyn Project Manager
The Warzyn Project Manager is Mr. Kevin Domack. The Warzyn Project Manager has the overall responsibility for ensuring that the project meets IEPA objectives and Warzyn's quality standards. In addition, he is responsible for technical quality control and project oversight, and will provide the Site Project Manager with access to corporate management.

The Beloit Corporation Site Project Manager and Warzyn Project Manager will:

- Define project objectives and develop a detailed work plan schedule
- Establish project policy and procedures to address the specific needs of the project as a whole, as well as the objectives of each task
- Acquire and apply technical and corporate resources as needed to ensure performance within budget and schedule constraints
- Orient field leaders and support staff concerning the project's special considerations
- Monitor and direct the field leaders
- Develop and meet ongoing project and/or task staffing requirements, including mechanisms to review and evaluate each task product
- Review the work performed on each task to assess its quality, responsiveness, and timeliness
- Review and analyze overall task performance with respect to planned requirements and authorizations
- Approve all external reports (deliverables) before their submission to the IEPA
- Ultimately be responsible for the preparation and quality of interim and final reports
- Represent the project team at meetings and public hearings

Warzyn Remedial Investigation Leader

The Warzyn RI Leader is Mr. R. Jeff Ramsby. The RI Leader is a support to the Warzyn Project Manager. He is responsible for leading and coordinating the day-to-day activities of the various resource specialists under his supervision. The RI Leader is a highly experienced environmental professional and will report directly to the Warzyn Project Manager. Specific responsibilities include:

- Provision of day-to-day coordination with the Project Managers on technical issues in specific areas of expertise

- Development and implementation of field-related work plans, assurance of schedule compliance, and adherence to management-developed study requirements

- Coordination and management of field activities including sampling, drilling, and field staff

- Implementation of QC for technical data provided by the field staff including field measurement data

- Adherence to work schedules provided by the Project Managers

- Review and approval of text and graphics required for field team efforts

- Coordination and oversight of technical efforts of subcontractors assisting the field team

- Identification of problems at the field team level, discussion of resolutions with the Project Managers, and provision of communication between team and upper management

- Participation in the preparation of the final RI report

Technical Staff
The technical staff for this project will be drawn from Warzyn's pool of corporate resources. The technical team staff will be utilized to gather and analyze data, and to prepare various task reports and support materials. All of the designated technical team staff are experienced professionals who possess the degree of specialization and technical competence required to effectively and efficiently perform the required work.

Warzyn Quality Assurance Officer
The Warzyn Quality Assurance Officer (QAO) is Mr. John Dadisman. The QAO will remain independent of direct job involvement and day-to-day operations, and has direct access to corporate executive staff as necessary to resolve any QA dispute. He is responsible for auditing the implementation of the QA program in conformance with the demands of specific investigations, Warzyn's policies, and U.S. EPA requirements. Specific functions and duties include:

- Provide QA audit on various phases of the field operations
- Review and approval of QA plans and procedures
- Provide QA technical assistance to project staff

IEPA Quality Assurance Officer
The IEPA QAO has the responsibility to review and approve the QAPP. The IEPA QAO is Ms. Janet Cruse.

2.2 SPECIALIZED RESPONSIBILITIES

2.2.1 Monitoring and Sampling Operations and QC

- Principal Engineering Firm - Warzyn, Madison, Wisconsin
- Drilling - To be determined through bidding process.
- Sampling, Monitoring and Survey - Warzyn, Madison, Wisconsin
- On Site Day-to-day Field Activities - RI Leader, Warzyn, Madison, Wisconsin
- Quality Control - QAO, Warzyn, Madison, Wisconsin

2.2.2 Laboratory Key Personnel

Laboratory Project Manager - The Enseco Laboratory Project Manager is Randy Greaves. The Enseco Laboratory Project Administrator is Kathy McKeeta. The Laboratory Project Manager is responsible for ensuring all resources of the laboratory are available on an as-required basis and providing an overview of the final analytical reports. The Project Administrator is responsible for daily communication and scheduling between the laboratory and the client.

Laboratory Operations Manager - The Enseco Laboratory Operations Manager is Steven Kramer. The Warzyn Manager is Mr. Gordon Gerry. The RMT Laboratory Manager is Mr. Eric Thomas. The Laboratory Operations Manager coordinates laboratory analyses, and oversee sample analysis, data review, and report preparation. The Laboratory Operations Manager approves the final report prior to submission.

Laboratory Quality Assurance Officer - The Enseco Laboratory Quality Assurance Officer (QAO) is Carl Craig. The Warzyn Laboratory QAO is Ms. Chris Wautlet. The RMT Laboratory QAO is Mr. Greg Graf. The laboratory QAO is responsible for overview of all QA/QC, and as such conducts detailed data reviews. In addition, all corrective actions are approved by the QAO.

Laboratory Sample Custodians - The Laboratory Sample Custodian will:

- Receive and inspect the incoming sample containers

- Record the condition of the incoming sample containers

- Sign appropriate documents

- Verify correct chain-of custody
- Notify appropriate laboratory of sample receipt and inspection
- Assign unique laboratory identification number to each sample and enter into the sample receiving log
- Initiate transfer of the samples to the appropriate lab sections
- Control and monitor access to sample and extract storage, and maintain in-house custody

2.2.3 Laboratory Analysis

- Analysis of groundwater and soil samples for TCL organics and TAL inorganics specified in Table 1-1:

  Enseco Rocky Mountain Analytical Laboratory
  4955 Yarrow Street
  Arvada, Colorado 80002

- Analysis of samples for indicator parameters (alkalinity, chloride, sulfate, total dissolved solids (TDS), nitrate and nitrite, ammonia, total phenolics) as specified in Table 1-1:

  Enseco Rocky Mountain Analytical Laboratory
  4955 Yarrow Street
  Arvada, Colorado 80002

- Analysis of sediment/soil samples for physical characteristics (hydraulic conductivity, grain size analysis) as specified in Table 1-1:

  Warzyn Soils Laboratory
  505 Science Drive
  Madison, WI 53711

- Analysis of soil samples for total organic carbon as specified in Table 1-1 will be subcontracted by Warzyn to:

  RMT Laboratories
  744 Heartland Trail
  Madison, WI 53717

2.2.4 Laboratory Data and QC
Laboratory Data

- Analytical protocol specified - Enseco, Arvada, Colorado
- Review of analytical protocol - Enseco, Warzyn technical staff
- Review of analytical procedures - IEPA Quality Assurance Section (QAS)
- Internal QA/QC - Laboratory QAO, Enseco, Warzyn
- Final data review and validation - Chemist, Warzyn, Madison, Wisconsin
- Review of tentatively identified compounds and assessment of need for confirmation - Chemist, Warzyn, Madison, Wisconsin

2.2.5 Performance and Systems Audits
Field Operations

- Internal Audits - QAO, Warzyn, Madison, Wisconsin
- External Audits - IEPA

Analytical Laboratories

- Internal Audits - Laboratory QAO, Enseco
- External Audits - IEPA

Final Evidence File

- Final Evidence File Audits - QAO, Warzyn, Madison, Wisconsin

3

QUALITY ASSURANCE OBJECTIVES FOR MEASUREMENT DATA

The overall QA objective is to develop and implement procedures for field sampling, chain-of-custody, laboratory analysis, and reporting that will provide results which are legally defensible in a court of law. Specific procedures for sampling, chain-of-custody, laboratory instruments calibration, laboratory analysis, reporting of data, internal quality control, audits, preventative maintenance of field equipment, and corrective action are described in other sections of this QAPP. The purpose of this section is to address the specific objectives for accuracy, precision, completeness, representativeness, and comparability.

3.1 LEVEL OF QUALITY CONTROL EFFORT

Field blank, trip blank, duplicate, and matrix spike samples will be analyzed to assess the quality of the data resulting from the field sampling program. Field and trip blanks consisting of deionized water, will be submitted to the analytical laboratories to provide the means to assess the quality of the data resulting from the field sampling program. Field blank samples are analyzed to check for procedural contamination at the site which may cause sample contamination. Trip blanks are used to assess the potential for contamination of samples due to contaminant migration during sample shipment and storage. Duplicate samples are analyzed to check for sampling and analytical reproducibility. Matrix spikes provide information about the effect of the sample matrix on the digestion and measurement methodology. Matrix spikes are performed in duplicate for organic analyses, and are hereinafter referred to as matrix spike/matrix spike duplicate (MS/MSD) samples. MS/MSD samples are designated/collected for organic analyses only.

The general level of the QC effort will be one field duplicate and one field blank for every 10 or fewer investigative samples. One volatile organic analysis (VOA) trip blank consisting of deionized, ultra pure water, will be included along with each shipment of aqueous VOA samples.

MS/MSD samples are investigative samples. Soil MS/MSD samples require no extra volume for VOAs or extractable organics. However, aqueous MS/MSD samples must be collected at triple the volume for VOAs and double the volume for extractable organics. One MS/MSD sample will be collected/designated for every 20 or fewer investigative samples per sample matrix (i.e., groundwater, soil). The number of field duplicate and field blank samples to be collected for this site are listed in Table 1-1. Sampling procedures are specified in the FSP (refer to Appendix A).

Soil and groundwater samples will be sent to Enseco Rocky Mountain Analytical Laboratory and Warzyn for analysis. Parameter lists and required quantitation levels are summarized in Tables 3-1, 3-2, and 3-3.

The level of laboratory QC effort for testing of TAL inorganics and TCL organics is specified in the current CLP Statements of Work (SOWs): ILM01.0 for inorganics, OLM02.0 for organics. The levels of laboratory QC effort for indicator and physical parameters are specified in Table 3-5.

The level of field QC effort for pH, specific conductance and temperature is specified in the method SOPs, and summarized in Table 3-5. The level of QC effort for the field GC volatiles analysis is specified in the SOP presented in Appendix C3, and summarized in Table 3-5.

3.2 ACCURACY, PRECISION, AND SENSITIVITY OF ANALYSES

The fundamental QA objective with respect to accuracy, precision, and sensitivity of laboratory analytical data is to achieve the QC acceptance criteria of the analytical protocols.

TCL Organics/TAL Inorganics
Laboratory analysis of TCL organics and TAL inorganics will follow the current CLP SOWs (OLM02.0 for organics, ILM01.0 for inorganics). The accuracy and precision, and sensitivity requirements are summarized within the CLP SOWs.

Enseco Laboratory Practical Quantitation Limits (PQLs) presented in Table 3-1A, will be provided for use in Baseline Risk Assessment Calculations. PQLs represent the lowest level for a compound that can be accurately and reproducibly quantitated and indicate a level at which measurements can be trusted. PQLs are the most appropriate limits to consider when evaluating non-detected chemicals (Risk Assessment Guidance for Superfund, U.S. EPA/540/1-89/002).

Indicators
SOPs for the indicator parameters (alkalinity, chloride, sulfate, TDS, nitrate and nitrite nitrogen, ammonia nitrogen and total phenolics) are provided in Appendix B. The accuracy and precision requirements of these analyses are summarized in Table 3-5. The sensitivity requirements of these analyses are summarized in Table 3-3.

Field Measurements
SOPs for the field equipment to measure pH, conductivity, and temperature are provided in Appendix C. The accuracy and precision requirements of these analyses are summarized in Table 3-5. The sensitivity requirements of these analyses are summarized in Table 3-3.

The SOP for the Field GC VOC Screening procedure is provided in Appendix C. The accuracy and precision requirements are summarized in Table 3-5, and sensitivity requirements in Table 3-4.

Physical Characteristics
The SOP for the hydraulic conductivity and grain size distribution is provided in Appendix B. The accuracy and precision requirements and sensitivity requirements for grain size distribution analysis are summarized in Tables 3-5 and 3-3, respectively.

Determination of Total Organic Carbon will follow method SW-846 9060. The SOP, accuracy, precision and sensitivity requirements are provided in Appendix B8.

3.3 COMPLETENESS, REPRESENTATIVENESS, AND COMPARABILITY

Completeness is a measure of the amount of valid data obtained from a measurement system compared to the amount that was expected to be obtained under normal conditions. It is expected that the participating laboratories will provide data meeting QC acceptance criteria for 95 percent or more for all samples tested using the SOWs and SOPs referenced in Section 3.2. Following completion of the analytical testing, the percent completeness will be calculated by the following equation:

$$\text{Completeness (\%)} = A/B \times 100$$

where, A = number of valid data
B = number of samples collected for each parameter analyzed

Representativeness expresses the degree to which data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, a process condition, or an environmental condition. Representativeness is a qualitative parameter which is dependent upon the proper design of the sampling program and proper laboratory protocol. The sampling network was designed to provide data representative of site conditions. During development of this network, consideration was given to past site activities, existing analytical data, physical setting and processes, and constraints inherent to the Superfund program. The rationale of the sampling network is discussed in detail in the FSP. Representativeness will be satisfied by insuring that the FSP is followed, proper sampling technique are used, proper analytical procedure are followed, and holding times of the samples are not exceeded in the laboratory. Representativeness will be assessed by the analysis of field duplicate samples.

Comparability expresses the confidence with which one data set can be compared with another. The extent to which existing and planned analytical data will be comparable, depends on the similarity of sampling and analytical methods. The procedures used to obtain the planned analytical data, as documented in the QAPP, are expected to provide comparable data. These new analytical data, however, may not be directly comparable to existing data because of differences in procedures and QA objectives.

4

SAMPLING PROCEDURES

Sampling procedures are described in the FSP which is contained in Appendix A of this document.

5

SAMPLE CUSTODY AND DOCUMENTATION

It is U.S. EPA policy to follow the U.S. EPA sample custody, or chain-of-custody protocols described in "NEIC Policies and Procedures", EPA-330/9-78-DDI-R, Revised June 1985. This custody is in three parts: sample collection, laboratory analysis, and final evidence files. Final evidence files, including all originals of laboratory reports and purge files, are maintained under document control in a secure area.

A sample or evidence file is under your custody if they:

- are in your possession;
- are in your view, after being in your possession;
- are in your possession and you place them in a secured location; or
- are in a designated secure area.

5.1 FIELD-SPECIFIC CUSTODY PROCEDURES

The sample packaging and shipment procedures summarized below will insure that the samples will arrive at the laboratory with the chain-of-custody intact. The protocol for sample designations are included in the FSP, Appendix A, of this QAPP.

5.1.1 Initiation of Chain-of-Custody Field Procedures

The field sampler is personally responsible for the care and custody of the samples until they are transferred or properly dispatched to the laboratory. As FEW people as possible should handle the samples.

All bottles will be tagged with sample numbers and locations.

Sample tags are to be completed for each sample using waterproof ink unless prohibited by weather conditions. For example, a logbook notation would explain that a pencil was used to fill out the sample tag because the ballpoint pen would not function in freezing weather.

5.1.2 Field Logbooks/Documentation

Field logbooks will provide the means of recording data collecting activities performed. As such, entries will be described in as much detail as possible so that persons going to the site could re-construct a particular situation without reliance on memory.

Field logbooks will be bound, field survey books or notebooks. Logbooks will be assigned to field personnel, but will be stored in the document control center when not in use. Each logbook will be identified by the project-specific document number.

The title page of each logbook will contain the following:

- Person to whom the logbook is assigned,
- Logbook number,
- Project name,
- Project start date, and
- Project end date.

Entries into the logbook will contain a variety of information. At the beginning of each entry, the date, start time, weather, names of all sampling team members present, level of personal protection being used, and the signature of the person making the entry will be entered. The names of visitors to the site, field sampling or investigation team personnel, and the purpose of their visit will also be recorded in the field logbook.

Measurements made and samples collected will be recorded. All entries will be made in ink, and no erasures will be made. If an incorrect entry is made, the information will be crossed out with a single strike mark. Whenever a sample is collected, or a measurement is made, a detailed description of the location of the station, which includes compass and distance measurements, shall be recorded. The number of the photographs taken of the station, if any, will also be noted. The equipment used to make measurements will be identified, along with the date of calibration.

Samples will be collected following the sampling procedures documented in the FSP, Appendix A, of this QAPP. The equipment used to collect samples will be noted, along with the time of sampling, sample description, depth at which the sample was collected, volume and number of containers. A sample identification number will be assigned prior to sample collection. Field duplicate samples, which will receive an entirely separate sample identification number, will be noted under sample description.

5.1.3 Transfer of Custody and Shipment Procedures

Samples are accompanied by a properly completed chain-of-custody form. The sample numbers and locations will be listed on the chain-of-custody form. When transferring the possession of samples, the individuals relinquishing and receiving will sign, date, and note the time on the record. This record documents transfer of custody of the samples from the sampler to another person to a mobile laboratory, to the permanent laboratory, or to/from a secure storage area.

Samples will be properly packaged for shipment and dispatched to the appropriate laboratory for analysis, with a separate signed custody record enclosed in each sample box or cooler. Shipping containers will be locked and secured with strapping tape and custody seals for shipment to the laboratory. The preferred procedure includes the use of a custody seal attached to the front right and back left of the cooler. The custody seals are covered with clear plastic tape. The cooler is strapped shut with strapping tape in at least two locations.

Whenever samples are split with another source or government agency, a separate sample custody record is prepared for those samples, and marked to indicate with whom the samples are being split with. The person relinquishing the samples to the facility or agency should request the representatives signature acknowledging the sample receipt. If the representative is unavailable or refuses, the person relinquishing the samples should note this in the "received by" space of the custody form.

All shipments will be accompanied by the chain-of-custody record identifying the contents. The original record will accompany the shipment, and the pink and yellow copies will be retained by the sampler for returning to the sampling office.

If the samples are sent by common carrier, a bill of lading should be used. Receipts of bills of lading will be retained as part of the permanent documentation. If sent by mail, the package will be registered with return receipt requested. Commercial carriers are not required to sign off on the custody forms as long as the custody forms are sealed inside the sample cooler, and the custody seals remain intact. The person shipping the samples should note the carrier name and airbill number on the chain-of-custody record.

5.2 LABORATORY CHAIN-OF-CUSTODY PROCEDURES

Laboratory custody procedures for the sample receiving and log-in; sample storage; tracking during sample preparation and analysis; and storage of data are described in the individual laboratory custody SOPs provided in Appendix D.

5.3 FINAL EVIDENCE FILE CUSTODY PROCEDURE

The final evidence file for the Beloit Corporation RI/FS will be located at and maintained by Warzyn. The content of the evidence file will include all relevant records, reports, correspondence, logs, field logbooks, laboratory sample preparation and analysis logbooks/documentation, analytical data packages, pictures, subcontractor reports, chain-of-custody records/forms, data review reports, etc.. The evidence file will be under custody of the file custodian in a locked, secured area.

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6

CALIBRATION PROCEDURES AND FREQUENCY

This section describes procedures for maintaining the accuracy of all the instruments and measuring equipment which are used for conducting field tests and laboratory analyses. These instruments and equipment should be calibrated prior to each use or on a scheduled, periodic basis.

6.1 FIELD INSTRUMENTS/EQUIPMENT

Instruments and equipment used to gather, generate, or measure environmental data will be calibrated with sufficient frequency and in such a manner that accuracy and reproducibility of results are consistent with the manufacturer's specifications.

Equipment used during the field sampling will be examined to certify that it is in operating condition. This includes checking the manufacturer's operating manual and the instructions for each instrument to determine that all prior equipment problems are not overlooked, and all necessary repairs to equipment have been carried out.

Calibration procedures and frequencies for field instruments are governed by the specific field SOPs provided in Appendix C. Field measurements include PID screening, pH, specific conductivity, and temperature.

The field GC VOC screening instrument calibration requirements are similar to those for laboratory instruments, and are provided in Appendix C.

6.2 LABORATORY INSTRUMENTS

Procedures for the calibration of laboratory instruments must be established and maintained so that equipment is functioning properly and that data collected are accurate and reliable. Requirements include step-by-step calibration procedures, frequency of re-calibration, equipment maintenance logs, instrument accuracy criteria, corrective action procedures and equipment limitations (e.g., working ranges), and are described, in detail, in the SOPs provided in Appendix B and C, and the CLP SOWs for organics and inorganics.

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7

ANALYTICAL PROCEDURES

Groundwater and soil samples collected during field sampling activities for the Beloit Corporation RI/FS will be analyzed by Enseco Rocky Mountain Analytical Laboratory and Warzyn. Refer to Table 1-1 for matrices, number of samples, parameters, and the laboratory performing the analysis.

7.1 FIELD SCREENING ANALYTICAL PROTOCOLS

The procedures for the field measurement of pH, temperature, specific conductivity and PID screening are described in the SOPs provided in Appendix C.

The procedure for the field GC VOC Screening analysis is described in the SOP provided in Appendix C.

7.2 LABORATORY ANALYSES

Samples (groundwater and soil samples) for CLP TCL organics and CLP TAL inorganics will be analyzed by Enseco Rocky Mountain Analytical Laboratory according to analytical procedures set forth in the current CLP SOW OLM02.0 and CLP SOW ILM01.0.

Groundwater samples for indicator parameters analyzed by Enseco Rocky Mountain Analytical Laboratory will follow the SOPs in Appendix B.

Analysis of soils for hydraulic conductivity and grain size analysis will be performed by the Warzyn Soils Laboratory using the methods provided in Appendix B.

Analysis of soils for Total Organic Carbon will be performed by RMT Laboratories using the method provided in Appendix B.

Refer to Table 7-1 for a summary of analytical methods for all analyses.

8

INTERNAL QUALITY CONTROL CHECK

8.1 FIELD SAMPLE COLLECTION

The assessment of field sampling precision and accuracy will be made through the collection of field duplicates and field blanks in accordance with the procedures described in the FSP (Appendix A of this QAPP). Refer to Table 1-1 for a summary of sample numbers and required field QC samples.

8.2 FIELD MEASUREMENTS

QC procedures for field measurements of PID, pH, specific conductivity, and temperature are limited to checking the reproducibility of the measurements by obtaining multiple readings on a single sample or standard, and by calibrating the instruments. Refer to Table 3-6 for a summary of QC requirements.

QC procedures for field GC VOC screening are similar to those used for laboratory analyses. Internal quality control checks are integrated into the analytical methods. The overall objectives of the internal quality control checks are to verify the established precision, accuracy and integrity of the methodology and to support the technical validity of the data. Internal quality control checks for field GC VOC analysis will include daily method blanks, field duplicates, and continuing calibration standards. Refer to Table 3-6 for a summary of QC requirements.

8.3 LABORATORY ANALYSIS

The laboratories used for the analysis of samples for the Beloit Corporation RI/FS (Enseco and Warzyn Laboratories) have written QA/QC programs which provide rules and guidelines to ensure the reliability and validity of work conducted at the laboratory. Compliance with the QA/QC program is coordinated and monitored by the laboratory QAOs, which are independent of the operating departments. Laboratory procedures used are documented in writing and are provided or referenced in this QAPP. Internal quality control checks are an integral part of the analytical methods, and are discussed in detail within the analytical procedures. The overall objectives of the internal quality control checks are to verify the established precision, accuracy and integrity of the methodology and to support the technical validity of the data. Where appropriate, internal quality control checks for other than those following the CLP SOWs will include method blanks, preparation/reagent blanks, calibration check samples, laboratory duplicates, matrix spikes and continuing calibration standards.

The required quality control frequency and performance criteria for TCL organics and TAL inorganics are summarized in the current CLP SOWs OLM02.0 and ILM01.0, respectively.

The required quality control frequency and performance criteria for the indicator parameters, and hydraulic conductivity and grain size distribution are summarized in Table 3-6. Criteria for Total Organic Carbon is provided in Appendix B8.

The performing laboratories will document, in each data package provided, that both initial and ongoing instrument and analytical QC functions have been met. Samples analyzed in non-conformance with the QC criteria set forth, will be reanalyzed by the laboratory. It is expected that sufficient sample volume will be collected for reanalysis.

9

DATA REDUCTION, VALIDATION, AND REPORTING

9.1 FIELD MEASUREMENTS AND SAMPLE COLLECTION

Raw data from field measurements and sample collection activities will be appropriately recorded in the field logbook. Data will be reviewed to ensure procedures were followed and QC requirements were met, however, no formal data validation effort will be performed. If the data are to be used in the project reports, they will be reduced onto data summary tables.

9.2 LABORATORY SERVICES

9.2.1 Data Reduction

Each laboratory is responsible for identification, quantification, data reporting, and data deliverables for the analyses performed. Data reduction of TCL organic will follow the requirements set forth in the CLP SOWs OLM02.0. Data reduction of TAL inorganic and indicators data will follow the requirements set forth in the CLP SOW ILM01.0. Deliverables will include raw data, summaries of calibration standards, duplicates, spikes, blanks, and performance evaluation samples.

9.2.2 Data Validation

Organic data generated under a DQO Level of 4 will be validated by Warzyn using National Functional Guidelines for Organic Data Review, Revised June, 1991, or most current guidelines available for each fraction (volatiles, semivolatiles, and pesticides/PCBs).

Inorganic data generated under a DQO Level of 4 will be validated by Warzyn using Laboratory Data Validation Functional Guidelines for Evaluating Inorganics Analyses, July 1988, or most current guidelines.

Indicator data generated under a DQO Level 3 will be validated by Warzyn using the Data Validation SOP provided in Appendix E.

Total organic carbon and grain size distribution data and hydraulic conductivity (DQO Level 3) will be reviewed to ensure procedures were followed and QC requirements were met, however, no formal data validation effort will be performed.

Refer to Table 1-3 for a summary of data generating activities, intended data uses, and associated DQOs for the site.

9.2.3 Data Reporting

Analytical data generated for the site will be computerized in a format organized to facilitate data review and evaluation. The computerized data set will include the data qualifiers provided by the performing laboratory in accordance with the CLP SOWs, as well as qualifiers added by the data reviewer in accordance with the data validation procedures noted in Section 9.2.2 of this QAPP.

The laboratory-provided qualifiers will include such items as:

- non-detects,
- concentration below required detection limit,
- estimated concentration due to poor QC data, and
- concentration of chemical also found in the laboratory blank.

The data review qualifiers will indicate whether the data are:

- usable as a quantitative concentration,
- usable with caution as an estimated concentration, or
- unusable due to out-of-control QC results.

A summary of the validated data will be incorporated into the RI report.

10

PERFORMANCE AND SYSTEM AUDITS

Performance and system audits of both field and laboratory activities will be conducted to determine that sampling and analysis are performed in accordance with the procedures established in the FSP and QAPP. The audits of field and laboratory activities include two separate independent parts: internal and external audits.

10.1 FIELD AUDITS

10.1.1 Internal Audits

Internal audits of field activities (sampling and measurements) will be conducted by the Warzyn QAO and/or RI Leader. The purpose of the field audit will be to evaluate and document adherence to procedures described in the QAPP and FSP. The audit will include review of field activities, sample documentation, chain-of-custody forms, field logbooks, and sampling and decontamination activities. Follow-up audits will be conducted to correct deficiencies, and to document that QA procedures are maintained throughout the investigation.

10.1.2 External Audits

External audits will be the responsibility of the IEPA.

10.2 LABORATORY AUDITS

10.2.1 Internal Audits

The purpose of the internal laboratory audit is to evaluate and document adherence to analytical procedures described in this QAPP. Internal audits of the participating laboratories are the responsibility of the individual laboratory QAO. System audits will include examination of laboratory documentation on sample receiving, sample log-in, sample storage, chain-of-custody procedure, sample preparation and analysis, instrument operating records, etc., and will be performed annually. Performance audits consisting of blind QC samples prepared and submitted to the laboratory for analysis, will be performed quarterly. Results of these blind QC samples will be reviewed by the laboratory QAO.

10.2.2 External Audits

The Illinois EPA DL/QAS may audit performing laboratories and provide recommendations for approval of the laboratory for the requested analyses to the IEPA RPM. The audit may consist of a review of analytical and chain-of-custody procedures, evaluation of performance samples, and may also include an on-site audit of each participating laboratory.

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11

PREVENTATIVE MAINTENANCE

11.1 FIELD INSTRUMENTS/EQUIPMENT

Field equipment used for this project include: PID meter, thermometers, pH meter, conductivity meter, gas-tech meter, electronic water level indicator, and sampling and filtering equipment. Specific preventative maintenance procedures to be followed for field equipment are those recommended by the manufacturer.

Field instruments will be checked and calibrated before they are transported to the field. These instruments will be checked and calibrated daily before use. Calibration checks will be performed as noted in Table 3-6 and will be recorded in the field logbook.

Critical spare parts such as electrodes, batteries, and pH probes will be kept on-site to minimize instrument down time. Backup instruments and equipment will be available to avoid delays in the field schedule.

Preventative maintenance of the gas chromatograph (GC) for screening of VOCs in the field will be as directed with manufacturer's specifications, instrument operating procedures, and the analytical method. Maintenance is carried out on a regular, scheduled basis, and is documented in the instrument service logbook. Emergency repair or scheduled manufacturer's maintenance is provided by an on-site technician or maintenance contract with the factory representative.

Routine preventative maintenance schedules are summarized in Table 11-1.

11.2 LABORATORY INSTRUMENTS

Preventative maintenance procedures for laboratory instrumentation and equipment for TCL organics are referenced in the current CLP SOW OLM02.0. Preventative maintenance procedures for laboratory instrumentation and equipment for TAL inorganics are referenced in the current CLP SOW ILM01.0.

Preventative maintenance of laboratory instruments associated with the indicator parameters will be as directed with manufacturer's specifications, instrument operating procedures, and analytical methods. Maintenance is carried out on a regular, scheduled basis, and is documented in the instrument service logbook for each instrument. Emergency repair or scheduled manufacturer's maintenance is provided by an on-site technician or maintenance contract with the factory representatives.

Routine preventative maintenance schedules are summarized in Table 11-1.

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12

SPECIFIC ROUTINE PROCEDURES USED TO ASSESS DATA PRECISION, ACCURACY, AND COMPLETENESS

12.1 FIELD MEASUREMENTS

Field data will be assessed by the site QAO. The site QAO will review the field results for compliance with the established QC criteria that are specified in the QAPP and FSP. Accuracy of field measurements will be assessed using daily instrument calibration, calibration check, and blank data. Precision will be assessed on the basis of reproducibility by taking multiple readings of a single sample. Data completeness will be calculated as follows:

$$\text{Completeness} = \frac{\text{Valid Data Obtained}}{\text{Total Data Planned}} \times 100\%$$

12.2 LABORATORY DATA

12.2.1 Precision

Precision of laboratory analysis will be assessed by comparing the analytical results between MS/MSD for organic analysis, and laboratory duplicate analyses for inorganic and indicator analysis. The relative percent difference (RPD) will be calculated for each pair of duplicate analysis results as follows:

$$RPD = \frac{|S - D|}{(S + D)/2} \times 100\%$$

where, S = First sample value (original or MS value)
D = Second sample value (duplicate or MSD value)

12.2.2 Accuracy

Accuracy of laboratory results will be assessed based on the established QC criteria that are described in Section 3 of this QAPP, using the analytical results of method blanks, matrix spike samples, field blanks, and bottle blanks. The percent recovery (%R) will be calculated as follows:

$$\%R = \frac{A - B}{C} \times 100\%$$

where, A = The concentration determined experimentally from the spiked sample;
B = The background level determined by a separate analysis of the unspiked sample; and
C = The amount of the spike added.

12.2.3 Completeness

The data completeness of laboratory analysis results will be assessed for compliance with the amount of data required for decision making. Completeness is calculated by the following formula:

$$\text{Completeness} = \frac{\text{Valid Data Obtained}}{\text{Total Data Planned}} \times 100\%$$

12.2.4 Sensitivity

The achievement of method detection limits depend on instrument sensitivity and matrix effects. It is important to monitor the instrument sensitivity to ensure the data quality through constant instrument performance. The instrument sensitivity will be monitored through the analysis of method blanks, calibration check samples, and laboratory control samples.

13

CORRECTIVE ACTION

Corrective actions may be required for two classes of problems: analytical and equipment problems, and noncompliance problems. Analytical and equipment problems may occur during sampling and sample handling, sample preparation, laboratory instrumental analysis, and data review.

For noncompliance problems, a formal corrective action program will be determined and implemented at the time the problem is identified. The person who identifies the problem is responsible for notifying the Warzyn Project Manager, who in turn will notify the IEPA RPM. If the problem is analytical in nature, information on these problems will be promptly communicated to the Warzyn Project Manager, who in turn will notify the RPM or IEPA QAS. Implementation of corrective action will be confirmed in writing through the same channels.

Any noncompliance with the established quality control procedures in the QAPP or FSP will be identified and corrected in accordance with the QAPP. The IEPA RPM, or his designee will issue a nonconformance report for each nonconformance condition.

Corrective actions will be implemented and documented in the field record book. No staff member will initiate corrective action without prior communication of findings through the proper channels. If corrective actions are insufficient, work may be stopped by stop-work order by the RPM.

13.1 SAMPLE COLLECTION/FIELD MEASUREMENT

Technical staff and project personnel will be responsible for reporting all suspected technical or QA nonconformances or suspected deficiencies of any activity or issued document by reporting the situation to the Warzyn RI Leader, or his designee. This manager, in consultation with the Warzyn Project Manager, will be responsible for assessing the suspected problems and making a decision based on the potential for the situation to impact the quality of the data. If it is determined that the situation warrants a reportable nonconformance requiring corrective action, then a nonconformance report will be initiated by the manager.

The manager will be responsible for ensuring that corrective action for nonconformances are initiated by:

- Evaluating all reported nonconformances

- Controlling additional work on nonconforming items

- Determining disposition or action to be taken

- Maintaining a log of nonconformances

- Reviewing nonconformance reports and corrective actions taken

- Ensuring nonconformance reports are included in the final site documentation in the project files

If appropriate, the Warzyn Project Manager will determine that, no additional work that is dependent on the nonconforming activity, is performed until the corrective actions are completed.

Corrective action for field measurements may include:

- Repeat the measurement to check the error
- Check for all proper adjustments for ambient conditions such as temperature
- Check the batteries
- Re-calibration
- Check the calibration
- Replace the instrument or measurement devices

  or
- Stop work (if necessary).

The Warzyn RI Leader, or his designee, is responsible for all site activities. In this role, the Warzyn RI Leader, at times is required to adjust the site programs to accommodate the site-specific needs. When it becomes necessary to modify a program, the Warzyn RI Leader notifies the Warzyn Project Manager of the anticipated change and implements the necessary changes after obtaining the approval of the Project Manager. The change in the program will be documented and signed by the appropriate personnel.

The Warzyn RI Leader for the site RI/FS is responsible for the controlling, tracking, and implementation of the identified changes. Reports on all changes will be distributed to all affected parties, including the IEPA RPM, the Warzyn Project Manager, and the Beloit Corporation Project Manager.

13.2 LABORATORY ANALYSIS

Corrective actions are required when an out-of-control event or potential out-of-control event is noted. The investigative action taken is dependent on the analysis and the event. Laboratory personnel are alerted that corrective actions may be necessary if:

- QC data are outside the warning or acceptable windows for precision and accuracy
- Blanks contain target analytes above acceptable levels
- Undesirable trends are detected in spike recoveries or RPD between duplicates
- There are unusual changes in detection limits
- Deficiencies are detected by the QA Department during internal or external audits, or from the results of performance evaluation samples

or

- Inquiries concerning data quality are received

Corrective action procedures are often handled at the bench level, by the analyst who reviews the sample preparation procedure for possible errors and checks the instrument calibration, spike and calibration mixes, instrument sensitivity, etc.. If the problem persists, or cannot be identified, the matter is referred to the laboratory supervisor, manager, or QAO for further investigation. Once resolved, full documentation of the corrective action procedure is filed with the QA Department.

14

Quality Assurance Reports To Management

Reports will be submitted to the IEPA as described in the Work Plan. Reports will consist of monthly progress reports, technical memoranda, and the draft RI report.

Monthly progress reports submitted to the IEPA will include:

- A summary of the validated sampling and testing results
- A description of activities completed during the past month, as well as actions which are scheduled for the next month
- A summary of target and actual completion dates for each activity
- Changes in key personnel
- Problems encountered and how they were resolved
- Anticipated problems and recommended solutions

The results of specific RI activities such as the Risk Assessment, and Site Characterization will be submitted to the IEPA in the form of Draft Technical Memoranda. Technical Memoranda will include the following:

- Source Characterization Results
- Contaminant and Migration Pathways Characterization Results
- Baseline Risk Assessment

A draft RI Report summarizing the RI activities will be submitted to the IEPA. The report will characterize the site and summarize the data collected and conclusions. The RI report will not be considered final until site characterization activities are complete for the supporting remedial alternatives screening activities and a letter of approval is issued by the IEPA RPM.

TABLES

TABLE 1-1

Revised QAPP
Sample Type and Estimated Sample Numbers
Phase 2
Beloit Corporation RI/FS

Sample[1] Matrix	Lab[2]	No. of Samples	Field Duplicates	Field[3] Blanks	MS/MSD[4]	Total No. Samples	Test[5,6] Parameters	Field Parameters
Soil Gas Survey [7]	Field	54	10	1/day	-	64+	Field GC Volatiles	
Surface & Subsurface [8] Soils	Enseco	(18 + 11)	3	-	2	34	TCL Organics	
	Enseco	(18 + 11)	3	-	2	34	TAL Inorganics	
	Warzyn	19	-	-	-	19	Grain Size Analysis	
	Warzyn	(6+9)	-	-	-	15	Total Organic Carbon[10]	
	Warzyn	7	-	-	-	7	Hydraulic Conductivity[11]	
Geotechnical Boring	Warzyn	5	-	-	-	5	Grain Size Analysis	
	Warzyn	5	-	-	-	5	Total Organic Carbon	
	Warzyn	1	-	-	-	1	Hydraulic Conductivity	
Groundwater Screen	Field	28	3	1/day	-	31+	Field GC Volatiles	
Soil Screen	Field	45	5	1/day	-	50+	Field GC Volatiles	
Groundwater[9]	Enseco	40	4	4	2	50	TCL Volatiles	pH, Conductivity
	Enseco	14	2	2	1	19	TCL Semivolatiles	Temperature
	Enseco	18	2	2	1	23	TCL Pest/PCBs	
	Enseco	14	2	2	1	19	TAL Inorganics	
	Enseco	11	2	2	1	16	Indicators	

Footnotes:

(1) Samples will be considered low concentration, and will be packaged and shipped accordingly.

(2) Enseco Rocky Mountain Analytical Laboratory
4955 Yarrow Street
Arvada, CO 80002

Warzyn Soils Laboratory
One Science Court
University Research Park
Madison, WI 53711

(3) A trip blank for VOC analysis will be included with each cooler shipped for aqueous groundwater samples. Trip blanks are not included in the total number of samples.

(4) EXTRA VOLUME REQUIREMENT: Extra volume is required for the aqueous MS/MSD quality control requirement (triple volume for VOCs, double volume for SVOCs and Pest/PCBs. Inorganics and general water quality indicator parameters require duplicate and spike analyses, however, do not require additional sample volume to meet the specified QC. MS/MSD samples are included in the total number of samples.

(5) Refer to Tables 3-1 and 3-2 for the TCL organic and TAL inorganic parameter lists and required detection limits.

(6) Groundwater samples for metals analysis will be field filtered through a 0.45 micron filter prior to the addition of preservatives.

(7) The total number of soil gas samples depends on additional samples collected to define soil gas anomalies. Refer to Table 1-3 for further detail.

(8) The total number of soil samples depends on additional samples collected to define the limits of identified source areas. Refer to Table 1-3 for further detail. This matrix includes both surface soils and subsurface soils from shallow and deep soil borings and the hydrogeologic investigation (W37) for QC purposes.

(9) Actual number of samples dependent on number of new wells installed. Refer to Table 1-3 for further detail.

(10) Physical parameter soil samples for total organic carbon will be subcontracted by Warzyn to RMT Laboratories, 744 Heartland Trail, Madison, WI 53717.

(11) The number of hydraulic conductivity samples from the deep soil borings is dependent upon the number of borings drilled (4 - 7), and the success in collecting the Shelby tubes.

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TABLE 1-2

Sample Quantities, Containers, Preservatives and Packaging Requirements
Beloit Corporation Facility RI/FS

Analysis	Bottles and Jars	Preservation	Technical Holding Time[a]	Volume of Samples	Shipping	Normal Packaging
Low Concentration (Organics)						
Groundwater						
Volatiles	Four 40-mL volatile organic analysis (VOA) vial.	1:1 HCL (2 drops/ vial), iced to 4°C.	14 days from sampling date	Fill completely no headspace	Shipped daily by overnight carrier	Vermiculite
Semi-volatiles	Two 1-Liter amber glass bottles	Iced to 4°C	Extract 7 days from sampling, analysis within 40 days after extraction	Fill bottle to neck	Shipped daily by overnight carrier	Vermiculite
Pesticides/PCBs	Two 1-Liter amber glass bottles	Iced to 4°C	Extract 7 days from sampling, analysis within 40 days after extraction	Fill bottle to neck	Shipped daily by overnight carrier	Vermiculite
Low Concentration (Inorganics)						
Groundwater						
Metals	One 1-liter high density polyethylene bottle	Field filter through 0.45 um filter. HNO_3 to pH<2. Iced to 4°C	180 days from sampling (26 days from sampling for mercury)	Fill to shoulder of bottle	Shipped daily by overnight carrier	Vermiculite
Cyanide	One 1-liter high density polyethylene bottle	Add NaOH to pH>12. Iced to 4°C	12 days from sampling	Fill to shoulder of bottle	Shipped daily by overnight carrier	Vermiculite
Water Quality Indicator Parameters						
Groundwater						
Nitrate+Nitrite-N, Ammonia	One 1-liter high density polyethylene bottle	Field filter through 0.45 um filter. H_2SO_4 to pH<2. Iced to 4°C.	28 days	Fill to shoulder of bottle	Shipped daily by overnight carrier	Vermiculite
Total-Phenolics	One 1-liter amber glass bottle	H_2SO_4 to pH<2. Iced to 4°C.	28 days	Fill to shoulder of bottle	Shipped daily by overnight carrier	Vermiculite
Alkalinity, Chloride, and Sulfate	One 1-liter high density polyethylene bottle	Field filter through 0.45 um filter. Iced to 4°C	28 days (14 days alkalinity)	Fill to shoulder of bottle	Shipped daily by overnight carrier	Vermiculite
TDS	One 500-mL polyethylene bottle	Field filter through 0.45 um filter. Iced to 4°C	7 days	Fill to shoulder of bottle	Shipped daily by overnight carrier	Vermiculite

TABLE 1-2

Analysis	Bottles and Jars	Technical Preservation	Holding Time(2)	Volume of Samples	Shipping	Normal Packaging(1)
Low or Med Concentration (Organics)						
Soil and Sediment Samples						
Semi-volatiles	One 8-oz wide mouth glass jar	Iced to 4°C	Extract 7 days from sampling, analysis within 40 days after extraction	Fill 3/4 full	Shipped daily by overnight carrier	Vermiculite (Med in cans/ vermiculite)
Pesticides/PCBs	One 8-oz wide mouth glass jar	Iced to 4°C	Extract 7 days from sampling, analysis within 40 days after extraction	Fill 3/4 full	Shipped daily by overnight carrier	Vermiculite (Med in cans/ vermiculite)
Volatiles	Two 4-oz wide mouth glass jars	Iced to 4°C	14 days from sampling date	Fill completely no headspace	Shipped daily by overnight carrier	Vermiculite (Med in cans/ vermiculite)
Low or Med Concentration (Inorganics)						
Soil and Sediment Samples						
Metals and Cyanide	One 8-oz wide mouth glass jar	Iced to 4°C	180 days from sampling (28 days from sampling for mercury and 14 days from sampling for cyanide)	Fill 3/4 full	Shipped daily by overnight carrier	Vermiculite (Med in cans/ vermiculite)
Physical Analysis						
Soil Samples						
Grain size analysis	Two 8-oz wide mouth glass jars	NONE	Not established	Fill 3/4 full	Ship by carrier	Vermiculite
Total Organic Carbon	One 4-oz wide mouth glass jar	NONE	28 days from	Fill 3/4 full	Ship by carrier	Vermiculite
Soil Gas Analysis						
Volatiles	One 1 Liter Tedlar Bag	Protect from sunlight, keep cool	Analyze as soon as possible. Maximum hold time 24 hours	Purge bag for 1 minute. Replace septum valve, fill completely and close valve	Analyze on site	---
Hydraulic Conductivity	One Shelby tube	Cap ends, store and transport upright	Not established	Sample according to Field SOP	Hand delivery	Not applicable

Notes:

1 The packing material should completely cushion the sample bottles - bottom, sides and top.
2. Technical hold times begin on the date sampled, and supersede contractual SOW hold times.

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TABLE 1-3

Revised QAPP
Summary of Data Generating Activities and Associated Quality Objectives
Beloit Corporation Facility RI/FS

Activity	Description	Intended Data Usages	Parameters	Data Quality Objective	Anticipated No. of Investigative Samples
Soil Gas Survey	Collect soil gas from shallow soil probes and analyze for VOCs.	Identify potential source areas within the site boundaries.	Field GC Volatiles	Level II Data	54[3]
Surface Soils	Collect and analyze 18 surface samples including 5 background location for TCL and TAL parameters.	Characterize the nature of the surface soil contamination.	TCL Organics TAL Inorganics TOC	Level IV Data Level IV Data Level III Data	18 18 6
Shallow Soil Borings	Collect and screen soil samples for GC volatile at 5 ft intervals. In addition, analyze 18 samples with a minimum of one from each of the 9 shallow soil boring locations for TCL and and TAL parameters. Collect and analyze groundwater at the water table for VOCs.	Characterize the nature of the subsurface soil contamination.	Field GC VOCs (Soil) TCL Organics TAL Inorganics GSA TOC Field GC VOCs (water) TOC	Level II Data Level IV Data Level IV Data Level III Data Level III Data Level II Data Level III Data	45[3] 11[3] 11[3] 9[3] 5 7 5
Deep Soil Borings	Drill 4 to 7 deep borings. (Three dependent on soil boring results.) Collect and analyze groundwater at 10 ft intervals for VOCs. Attempt to collect 1 Shelby tube sample at each boring	Soil borings will be used to characterize site geology, and screen groundwater for VOCs with changes in depth.	Field GC VOC (Water) GSA Hydraulic Conductivity TOC	Level II Data Level III Data Level III Data Level III Data	28 4[5] 4[5] 5[5]
Geotechnical Boring	Drill 1 Geotechnical boring. Collect 5 split spoon soil and 1 Shelby Tube sample.	Characterize site geology	GSA, TOC Hydraulic Conductivity	Level III Data Level III Data	5[5] 1[6]
Assessment of Production Well Influence	Monitor pumping well rates and monitoring well water levels.	Determine influence of pumping wells on local groundwater flow.	Water Levels Pumping Rates	Level II Data	NA
Hydrogeologic Investigation	1 soil boring will be drilled, with soils to be collected and described in the field. Install 1 monitoring well (W37) for water level control	Describe geologic strata to determine groundwater flow direction and rate through soil boring logs, and water level	GSA	Level II Data	3

TABLE 1-3

Activity	Description	Intended Data Usages	Parameters	Data Quality Objective	Anticipated No. of Investigative Samples
Groundwater Sampling	Round 2 sampling at a minimum of 40 monitoring wells for selected TCL, TAL and indicator parameters. (See Table 2 of Work Plan Addendum No. 1. and Table 1-1 of Revised QAPP).	Characterize and evaluate the contamination on site.	TCL Volatiles	Level IV Data	40(4)
			TAL Inorganics(1)	Level IV Data	14
			Indicators(2)	Level III Data	11
			TCL SVOC	Level IV Data	14
			TCL Pesticides/PCBs	Level IV Data	18

Footnotes:

1. Groundwater samples to be filtered for dissolved TAL Inorganic analysis and indicator parameters.
2. Indicator parameters consist of: chloride, sulfate, alkalinity, nitrate and nitrite-nitrogen, ammonia-nitrogen, total-phenolics, and TDS.
3. The number of investigative samples is contingent on the number of additional locations as specified in the Phase II Work Plan Addendum.
4. The number of groundwater samples collected is contingent upon the number of wells installed in the deep groundwater quality borings, and the number of wells installed as part of the shallow soil boring program.
5. Physical parameters are identified by analysis for each activity. The actual number of samples is contingent upon stratigraphic units encountered during drilling activities.
6. The number of hydraulic conductivity samples from the deep soil borings is dependent upon the number of borings drilled (4-7), and the success in collecting the shelby tubes.

JAH/vlr/JDD/KJQ
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TABLE 3-1

Target Compound List and Contract Required Quantitation Limits - Organics

Compound	Quantitation Limits* Water (ug/l)	Low Soil (ug/kg)	Medium Soil (ug/kg)
Volatiles			
1. Chloromethane	10	10	1200
2. Bromomethane	10	10	1200
3. Vinyl chloride	10	10	1200
4. Chloroethane	10	10	1200
5. Methylene chloride	10	10	1200
6. Acetone	10	10	1200
7. Carbon disulfide	10	10	1200
8. 1,1-Dichloroethene	10	10	1200
9. 1,1-Dichloroethane	10	10	1200
10. 1,2-Dichloroethene (total)	10	10	1200
11. Chloroform	10	10	1200
12. 1,2-Dichloroethane	10	10	1200
13. 2-Butanone	10	10	1200
14. 1,1,1-Trichloroethane	10	10	1200
15. Carbon tetrachloride	10	10	1200
16. Bromodichloromethane	10	10	1200
17. 1,2-Dichloropropane	10	10	1200
18. cis-1,3-Dichloropropene	10	10	1200
19. Trichloroethene	10	10	1200
20. Dibromochloromethane	10	10	1200
21. 1,1,2-Trichloroethane	10	10	1200
22. Benzene	10	10	1200
23. trans-1,3-Dichloropropene	10	10	1200
24. Bromoform	10	10	1200
25. 4-Methyl-2-pentanone	10	10	1200

TABLE 3-1

	Compound	Quantitation Limits Water (ug/L)	Low Soil (ug/kg)	Medium Soil (ug/kg)
26.	2-Hexanone	10	10	1200
27.	Tetrachloroethene	10	10	1200
28.	Toluene	10	10	1200
29.	1,1,2,2-Tetrachloroethane	10	10	1200
30.	Chlorobenzene	10	10	1200
31.	Ethylbenzene	10	10	1200
32.	Styrene	10	10	1200
33.	Xylenes (total)	10	10	1200
Semi-Volatiles				
34.	Phenol	10	330	10000
35.	bis(2-Chloroethyl) ether	10	330	10000
36.	2-Chlorophenol	10	330	10000
37.	1,3-Dichlorobenzene	10	330	10000
38.	1,4-Dichlorobenzene	10	330	10000
39.	1,2-Dichlorobeznene	10	330	10000
40.	2-Methylphenol	10	330	10000
41.	2,2'-oxybis-(1-Chloropropane)	10	330	10000
42.	4-Methylphenol	10	330	10000
43.	n-Nitroso-di-n-dipropylamine	10	330	10000
44.	Hexachloroethane	10	330	10000
45.	Nitrobenzene	10	330	10000
46.	Isophorone	10	330	10000
47.	2-Nitrophenol	10	330	10000
48.	2,4-Dimethylphenol	10	330	10000
49.	bis(2-Chloroethoxy) methane	10	330	10000
50.	2,4-Dichlorophenol	10	330	10000
51.	1,2,4-Trichlorobenzene	10	330	10000
52.	Naphthalene	10	330	10000
53.	4-Chloroaniline	10	330	10000
54.	Hexachlorobutadiene	10	330	10000
55.	4-Chloro-3-methylphenol	10	330	10000
56.	2-Methylnaphthalene	10	330	10000

TABLE 3-1

	Compound	Quantitation Limits* Water (ug/L)	Low Soil (ug/kg)	Medium Soil (ug/kg)
57.	Hexachlorocyclopentadiene	10	330	10000
58.	2,4,6-Trichlorophenol	10	330	10000
59.	2,4,5-Trichlorophenol	25	800	25000
60.	2-Chloronaphthalene	10	330	10000
61.	2-Nitroaniline	25	800	25000
62.	Dimethylphthalate	10	330	10000
63.	Acenaphthylene	10	330	10000
64.	2,6-Dinitrotoluene	10	330	10000
65.	3-Nitroaniline	25	800	25000
66.	Acenaphthene	10	330	10000
67.	2,4-Dinitrophenol	25	800	25000
68.	4-Nitrophenol	25	800	25000
69.	Dibenzofuran	10	330	10000
70.	2,4-Dinitrotoluene	10	330	10000
71.	Diethylphthalate	10	330	10000
72.	4-Chlorophenyl-phenyl ether	10	330	10000
73.	Fluorene	10	330	10000
74.	4-Nitroaniline	25	800	25000
75.	4,6-Dinitro-2-methylphenol	25	800	25000
76.	n-Nitrosodiphenylamine	10	330	10000
77.	4-Bromophenyl-phenyl ether	10	330	10000
78.	Hexachlorobenzene	10	330	10000
79.	Pentachlorophenol	25	800	25000
80.	Phenanthrene	10	330	10000
81.	Anthracene	10	330	10000
82.	Carbazole	10	330	10000
83.	Di-n-butylphthalate	10	330	10000
84.	Fluoranthene	10	330	10000
85.	Pyrene	10	330	10000
86.	Butylbenzylphthalate	10	330	10000
87.	3,3'-Dichlorobenzidine	10	330	10000
88.	Benzo(a)anthracene	10	330	10000

TABLE 3-1

Compound	Water (ug/L)	Low Soil (ug/kg)	Medium Soil (ug/kg)
	Quantitation Limits		
89. Chrysene	10	330	10000
90. bis(2-Ethylhexyl)phthalate	10	330	10000
91. Di-n-ocylphthalate	10	330	10000
92. Benzo(b)fluoranthene	10	330	10000
93. Benzo(k)fluoranthene	10	330	10000
94. Benzo(a)pyrene	10	330	10000
95. Indeno(1,2,3-cd)pyrene	10	330	10000
96. Dibenzo(a,h)anthracene	10	330	10000
97. Benzo(g,h,i)perylene	10	330	10000
Pesticides/PCBs			
98. alpha-BHC	0.05	1.7	1.7
99. beta-BHC	0.05	1.7	1.7
100. delta-BHC	0.05	1.7	1.7
101. gamma-BHC (Lindane)	0.05	1.7	1.7
102. Heptachlor	0.05	1.7	1.7
103. Aldrin	0.05	1.7	1.7
104. Heptachlor epoxide	0.05	1.7	1.7
105. Endosulfan I	0.05	1.7	1.7
106. Dieldrin	0.10	3.3	3.3
107. 4,4'-DDE	0.10	3.3	3.3
108. Endrin	0.10	3.3	3.3
109. Endosulfan II	0.10	3.3	3.3
110. 4,4'-DDD	0.10	3.3	3.3
111. Endosulfan sulfate	0.10	3.3	3.3
112. 4,4'-DDT	0.10	3.3	3.3
113. Methoxychlor	0.50	17	17
114. Endrin ketone	0.10	3.3	3.3
115. Endrin aldehyde	0.10	3.3	3.3
116. alpha-Chlordane	0.05	1.7	1.7
117. gamma-Chlordane	0.05	1.7	1.7
118. Toxaphene	5.0	170	170
119. Aroclor-1016	1.0	33	33
120. Aroclor-1221	2.0	67	67

TABLE 3-1

Compound	Water (ug/L)	Low Soil (ug/kg)	Medium Soil (ug/kg)
	Quantitation Limits*		
121. Aroclor-1232	1.0	33	33
122. Aroclor-1242	1.0	33	33
123. Aroclor-1248	1.0	33	33
124. Aroclor-1254	1.0	33	33
125. Aroclor-1260	1.0	33	33

* Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on a dry weight basis as required by the method, will be higher.

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TABLE 3-1A

Target Compound List
Practical Quantitation Limits - Organics

		Quantitation Limits[a]	
Compound		**Water (ug/l)**	**Low Soil (ug/kg)**
Volatiles			
1.	Chloromethane	6	6
2.	Bromomethane	4	4
3.	Vinyl chloride	4	4
4.	Chloroethane	10	10
5.	Methylene chloride	3	3
6.	Acetone	10	10
7.	Carbon disulfide	5	5
8.	1,1-Dichloroethene	5	5
9.	1,1-Dichloroethane	4	4
10.	1,2-Dichloroethene (total)	5	5
11.	Chloroform	2	2
12.	1,2-Dichloroethane	4	4
13.	2-Butanone	10	10
14.	1,1,1-Trichloroethane	3	3
15.	Carbon tetrachloride	3	3
16.	Bromodichloromethane	2	2
17.	1,2-Dichloropropane	3	3
18.	cis-1,3-Dichloropropene	5	5
19.	Trichloroethene	3	3
20.	Dibromochloromethane	4	4
21.	1,1,2-Trichloroethane	5	5
22.	Benzene	2	2
23.	trans-1,3-Dichloropropene	3	3
24.	Bromoform	5	5
25.	4-Methyl-2-pentanone	10	10
26.	2-Hexanone	10	10
27.	Tetrachloroethene	2	2
28.	Toluene	3	3
29.	1,1,2,2-Tetrachloroethane	5	5
30.	Chlorobenzene	2	2
31.	Ethylbenzene	5	5
32.	Styrene	5	5
33.	Xylenes (total)	5	5

Semi-Volatiles

34.	Phenol	5	300
35.	bis(2-Chloroethyl) ether	5	160
36.	2-Chlorophenol	5	150
37.	1,3-Dichlorobenzene	4	150
38.	1,4-Dichlorobenzene	10	110
39.	1,2-Dichlorobeznene	5	150
40.	2-Methylphenol	7	230
41.	2,2'-oxybis-(1-Chloropropane)	10	330
42.	4-Methylphenol	6	210
43.	n-Nitroso-di-n-dipropylamine	6	300
44.	Hexachloroethane	4	150
45.	Nitrobenzene	7	230
46.	Isophorone	5	150
47.	2-Nitrophenol	8	250
48.	2,4-Dimethylphenol	5	300
49.	bis(2-Chloroethoxy) methane	6	240
50.	2,4-Dichlorophenol	4	300
51.	1,2,4-Trichlorobenzene	6	300
52.	Naphthalene	6	190
53.	4-Chloroaniline	8	300
54.	Hexachlorobutadiene	6	300
55.	4-Chloro-3-methylphenol	4	300
56.	2-Methylnaphthalene	5	300
57.	Hexachlorocyclopentadiene	9	300
58.	2,4,6-Trichlorophenol	4	130
59.	2,4,5-Trichlorophenol	4	420
60.	2-Chloronaphthalene	8	270
61.	2-Nitroaniline	25	800
62.	Dimethylphthalate	9	300
63.	Acenaphthylene	9	300
64.	2,6-Dinitrotoluene	6	300
65.	3-Nitroaniline	25	800
66.	Acenaphthene	9	300
67.	2,4-Dinitrophenol	25	800
68.	4-Nitrophenol	25	800
69.	Dibenzofuran	8	250
70.	2,4-Dinitrotoluene	9	300
71.	Diethylphthalate	10	330
72.	4-Chlorophenyl-phenyl ether	6	210
73.	Fluorene	5	150
74.	4-Nitroaniline	25	800
75.	4,6-Dinitro-2-methylphenol	25	800
76.	n-Nitrosodiphenylamine	8	300
77.	4-Bromophenyl-phenyl ether	8	250
78.	Hexachlorobenzene	10	330

79.	Pentachlorophenol	25	800
80.	Phenanthrene	8	270
81.	Anthracene	6	190
82.	Carbazole	10	330
83.	Di-n-butylphthalate	10	330
84.	Fluoranthene	7	230
85.	Pyrene	7	250
86.	Butylbenzylphthalate	9	290
87.	3,3'-Dichlorobenzidine	10	330
88.	Benzo(a)anthracene	3	83
89.	Chrysene	3	110
90.	bis(2-Ethylhexyl)phthalate	8	260
91.	Di-n-ocylphthalate	7	240
92.	Benzo(b)fluoranthene	8	270
93.	Benzo(k)fluoranthene	10	330
94.	Benzo(a)pyrene	9	300
95.	Indeno(1,2,3-cd)pyrene	9	300
96.	Dibenzo(a,h)anthracene	10	330
97.	Benzo(g,h,i)perylene	10	330

Pesticides/PCBs

98.	alpha-BHC	0.03	0.01
99.	beta-BHC	0.01	0.01
100.	delta-BHC	0.04	0.01
101.	gamma-BHC (Lindane)	0.04	0.1
102.	Heptachlor	0.03	0.01
103.	Aldrin	0.04	0.01
104.	Heptachlor epoxide	0.04	0.01
105.	Endosulfan I	0.04	0.02
106.	Dieldrin	0.05	0.02
107.	4,4'-DDE	0.01	0.02
108.	Endrin	0.05	0.02
109.	Endosulfan II	0.04	0.02
110.	4,4'-DDD	0.10	0.02
111.	Endosulfan sulfate	0.08	0.02
112.	4,4'-DDT	0.10	0.02
113.	Methoxychlor	0.10	0.1
114.	Endrin ketone	0.06	0.02
115.	Endrin aldehyde	0.06	0.02
116.	alpha-Chlordane	0.04	0.01
117.	gamma-Chlordane	0.04	0.1
118.	Toxaphene	1.0	0.2
119.	Aroclor-1016	1.0	0.1
120.	Aroclor-1221	1.0	0.1
121.	Aroclor-1232	1.0	0.1
122.	Aroclor-1242	1.0	0.1
123.	Aroclor-1248	1.0	0.1
124.	Aroclor-1254	1.0	0.2
125.	Aroclor-1260	1.0	0.2

This table presents Practical Quantitation Limits (PQLs) for organic compound analyzed using CLP methodology.

- Quantitation limits listed for soil/sediment are based on wet weight. The quantitation limits calculated by the laboratory for soil/sediment, calculated on a dry weight basis as required by the method, will be higher.

  Method detection limits are updated periodically. Exact MDLs will represent the current calculated MDL. PQLs are based on the MDL studies and are subject to change.

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TABLE 3-2

Target Analyte List and Contract Required Detection Limits - Inorganics

	Analyte	Contract Required [1,2] Detection Limit (ug/L)
1.	Aluminum	200
2.	Antimony	60
3.	Arsenic	10
4.	Barium	200
5.	Beryllium	5
6.	Cadmium	5
7.	Calcium	5000
8.	Chromium	10
9.	Cobalt	50
10.	Copper	25
11.	Iron	100
12.	Lead	3
13.	Magnesium	5000
14.	Manganese	15
15.	Mercury	0.2
16.	Nickel	40
17.	Potassium	5000
18.	Selenium	5
19.	Silver	10
20.	Sodium	5000
21.	Thallium	10
22.	Vanadium	50
23.	Zinc	20
24.	Cyanide	10

Notes:

1. Subject to the restrictions specified in the first page of Part G, Section IV of Exhibit D (Alternate Methods - Catastrophic Failure) any analytical method specified in SOW Exhibit D may be utilized as long as the documented instrument or method detection limits meet the Contract Required Detection Limit (CRDL) requirements. Higher detection limits may only be used in the following circumstance:

   If the sample concentration exceeds five times the detection limit of the instrument or method in use, the values may be reported even though the instrument or method detection limit may no equal the CRDL. This is illustrated in the example below:

For lead:
Method in use = ICP
Instrument Detection Limit (IDL) = 40
Sample concentration = 200
CRDL = 3

The value of 200 may be reported even though the instrument detection limit is greater than the CRDL. The instrument or method detection limit must be documented as described in Exhibit E.

2. The CRDL are the instrument detection limits obtained in pure water that must be met using the procedure in Exhibit E. The detection limits for samples may be considerably higher depending on the sample matrix. Soil/sediment detection limits are approximately 200 times the CRDLs noted for water, and may vary as the soil/sediment results are reported on a dry weight basis. Soil/sediment results are reported in mg/kg.

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TABLE 3-3

Indicators, Field Measurements, and Physical Characteristics Parameter Lists and Required Detection Limits

Indicator Parameter	Required Detection Limit (mg/L)
Alkalinity	5
Chloride	3
Sulfate	5
Total Dissolved Solids	10
Nitrate+Nitrite Nitrogen	0.10
Ammonia Nitrogen	0.10
Total Phenolics	0.010

Field Measurement Parameter	Required Detection Limit
pH (s.u.)	sensitivity of 0.05
Conductivity @25 Deg. C (umhos/cm)	10
Temperature (Deg. C)	to nearest 0.5 degree
PID Screening (units)	1

Physical Characteristic Parameter	Required Detection Limit
Grain size distribution	NA
Total Organic Carbon	100 mg/kg
Permeability - Rigid Wall (cm/sec)	NA

NA = Not applicable to method.

JAH/cas/JDD/BLH
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TABLE 3-4

Field GC VOC Target Analyte List Detection Limits

Compound	Detection Limit ng on column	Groundwater Reportable Detection Limit (ug/L)	Soil Gas Reportable Detection Limit (ug/L-Vol)
Benzene	10	2.0	5.0
1,1-Dichloroethane	10	2.0	5.0
1,2-Dichloroethane	10	5.0	5.0
1,1-Dichloroethene	5	1.0	5.0
cis-1,2-Dichloroethene	5	1.0	5.0
trans-1,2-Dichloroethene	5	1.0	5.0
Ethylbenzene	10	2.0	5.0
Tetrachloroethene	5	1.0	5.0
Toluene	5	1.0	5.0
1,1,1-Trichloroethane	5	1.0	5.0
Trichloroethene	5	1.0	5.0
Xylenes	15	3.0	5.0

JAH/ndj/JDD/BLH
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TABLE 3-5

Summary of Quality Control Requirements
Beloit Corporation Facility RI/FS

PARAMETER	AUDIT	FREQUENCY[1]	LIMITS[2]
TCL Organics	Requirements per OLM01.0 (or most current)		
TAL Inorganics	Requirements per ILM02.0 (or most current)		
Field GC VOCs			
	Method Blank	daily	< Detection Limit (DL)
	Check Standard	After every 10 samples and at the end of the run.	70 - 130 % Recovery
	Duplicate	1 per 10 samples	25% RPD (± 2xDL if sample concentration is <5 x DL)
Alkalinity, Chloride, Sulfate, Nitrate + Nitrite Nitrogen			
	Lab Blank	After calibration, every 10 samples, and at the end of the run.	< Detection Limit (DL)
	Check Standard	After calibration, every 10 samples, and at the end of the run.	90 - 110 % Recovery
	EPA QC Reference Standard	1 per set	80 - 120 % Recovery
	Lab Duplicate	1 per 10 samples	10% RPD (± 2xDL if sample concentration is <5 x DL)
	Matrix Spike	1 per 10 samples	85 - 115 % Recovery
Total Dissolved Solids			
	Lab Blank	1 per set	< DL
	EPA QC Reference Standard	1 per set	80 - 120 % Recovery
	Lab Duplicate	1 per 10 samples	10% RPD (± 2xDL if sample concentration is <5 x DL)
Ammonia Nitrogen, Total Phenolics	Lab Blank	After calibration, every 10 samples, and at the end of the run.	< DL
	Check Standard	After calibration, every 10 samples, and at the end of the run.	90 - 110 % Recovery
	Preparation Blank	1 per set	< DL
	EPA QC Reference Standard	1 per set	80 - 120 % Recovery
	Lab Duplicate	1 per 10 samples	20% RPD (± 2xDL if sample concentration is <5 x DL)
	Matrix Spike	1 per 10 samples	85 - 115 % Recovery
Grain Size Distribution			
	Lab Duplicate	1 per 10 samples	10% RPD or <2% by weight

TABLE 3-5

PARAMETER	AUDIT	FREQUENCY[1]	LIMITS[2]
Total Organic Carbon			
	lab blank	1 per 10 samples	<DL
	Check Standard	1 per 10 samples	90 - 110% Rec
	Lab Duplicate	1 per 10 samples	20% RPD (±DL if sample concentration is <5 x DL)
	Matrix Spike	1 per 10 samples	75 - 125% Recovery
Hydraulic Conductivity	Lab Duplicate	1 per 10 samples	10% RPD
pH (Field)			
	Check Standard	1 per 10 samples	± 0.05 pH unit of buffer selection
	Duplicate	1 per 10 samples	± 0.2 pH unit
Specific Conductance (Field)			
	Check Standard	1 per 10 samples	± 5% of standard
	Duplicate	1 per 10 samples	15% RPD (± 2xDL if sample concentration is <5 x DL)

[1] Frequencies apply to each individual matrix.

[2] Refer to Appendix B for required detection limits for each analyte.

JAH/ cas/JDD/BLH
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TABLE 7-1

Summary of Analytical Methods
Beloit Corporation Facility RI/FS

Parameter	SOP[1]	Method[2]
TCL Volatiles	SOW OLM02.0	CLP Protocol
TCL Semi-volatiles	SOW OLM02.0	CLP Protocol
TCL Pesticides/PCBs	SOW OLM02.0	CLP Protocol
TAL Inorganics	SOW ILM01.0	CLP Protocol
Alkalinity	LM-RMA-1071	EPA 310.2
Total dissolved solids	LM-RMA-1060	EPA 160.1
Chloride	LM-RMA-1025	EPA 300
Sulfate	LM-RMA-1025	EPA 300
Ammonia nitrogen	LM-RMA-1114	EPA 350.2
Nitrite + nitrate nitrogen	LM-RMA-1120	EPA 353.2
Total Phenolics	LM-RMA-1099	EPA 420.1
Field Measurements		
Field GC VOCs	BC-FGC	SW-846 8310/ 8010/8020
pH	pH1	EPA 150.1
Specific conductance	CONDYSIF	EPA 120.1
Physical Parameters		
PID	HNU IOP[3]	NA
Grain Size Analysis	903	ASTM D422, D1140
Total Organic Carbon	RMT 2.44	SW-846 9060
Hydraulic Conductivity	908	US Army Corps of Engineers Manual, EM-1110-2-1906, VII

Footnotes:

(1) SOP refers to either the EPA SOW, or the Warzyn laboratory document number.

(2) Method refers to the published analytical reference.

(3) Refer to FSP.

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TABLE 11-1

Routine Preventative Maintenance Procedures and Schedules
Beloit Corporation Facility RI/FS

Instrument	Maintenance Procedures/Schedule	Spare Parts in Stock
Enseco Rocky Mountain Analytical		
Gas Chromatograph/Gas Spectrometry (GC/MS)-Volatiles	1. Change septa as needed. 2. Column maintenance as needed. 3. Clean injection port liner as needed. 4. Backflush purge and trap device as needed. 5. Change trap as needed.	1. Septa 2. GC columns 3. Syringes 4. Various electronic components 5. Traps
GC/MS - Semivolatiles	1. Change septa every 12 hours. 2. Clean or replace injection port liner every 12 hours. 3. Clean injection port every 12 hours. 4. Column maintenance very 12 hours.	1. Septa 2. Syringes 3. GC columns 4. Injection port liner 5. Various electronic components
GC - Pesticides/PCBs	1. Replace septa every 72 hours. 2. Replace first 2-3 in. of column packing every 72 hours. 3. Replace injector port liner every 72 hours. 4. Clean injector port with a series of four solvents every 72 hours.	1. Septa 2. Syringes 3. Column packing material 4. Injector port liner 5. Various electronic components
Graphic Furnace Atomic Absorption Spectrometer	1. Clean furnace chamber, contact rings, and furnace windows with alcohol daily. 2. Change contact rings as needed. 3. Ensure sufficient supply of D.I. H_20 in rinse bottle, daily. 4. Check gas pressure, daily.	1. Contact rings 2. Graphite tubes 3. Spare shroud
Flame Atomic Absorption Spectrometer	1. Clean burner head when necessary. 2. Check water trap to ensure it is full and clean prior to analysis. 3. Empty drain vessel when necessary. 4. Clean/inspect/optimize nebulizer monthly or as needed. 5. Clean & check o-rings monthly or as needed. 6. Rinse spray chamber with D.I. H_2O when run is completed.	1. Burner Head 2. Nebulizer tubing 3. O-rings 3. O-rings 4. Nebulizer
Inductively Coupled Plasma Spectrometer (ICP)	A. Daily 1. Check peristaltic pump rollers to ensure all are moving freely. 2. Change pump tubing. 3. Perform BEC check. 4. Rinse spray chamber with dilute HNO_3 followed by D.I. H_20 when finished with last run of day. 5. Check to ensure gas supply is adequate. B. As Needed 1. Replace or clean nebulizer tips. 2. Disassemble torch, clean, and replace o-rings. 3. Perform wavelength calibration.	1. Torch 1. Torch 2. O-rings 3. Spray chamber 4. RF Coil 5. Nebulizer Tips 6. Pump tubing
Cold Vapor Atomic Absorption Spectrometer	1. Clean/inspect quartz cell daily. 2. Change pump tubing daily. 3. DI water rinse 10-15 minutes at end of run. 4. Check gas pressure daily. 5. Empty drain vessel daily.	1. Pump tubing 2. Quartz cell 3. Sampler probe
Techicon Autoanalyzer	1. Rinse manifold with degassed Milli-Q water before analysis.	1. Pump tubes 2 Light Bulbs

TABLE 11-1

Instrument	Maintenance Procedures/Schedule	Spare Parts in Stock
	2. Rinse manifold with recommended cleaning solution and oil . 3. Inspect pump tubings before analysis; replace if discolored or distorted. 4. Clean work area daily.	
Spectrophotometer	1. Monitor and document absorbance for each analysis. 2. Rinse with DI water before and after analysis.	1. Light source bulbs
Ovens	1. Clean every month. 2. Monitor and document temperature daily.	1. Thermometer
pH Meter	1. Daily calibration. 2. Daily inspection of filling solution; add or replace when necessary.	1. Filling solution 2. pH buffers
Thermometers	1. Biannual calibration with an ASTM certified thermometer.	
Balances	1. Daily calibration with ASTM weights (S class). 2. Yearly calibration by an ASTM certified technician. 3. Daily cleaning.	
Warzyn Field Instrumentation:		
Gas Chromatograph -Field GC VOCs	1. Change septa as needed. 2. Column maintenance as needed. 3. Clean injection port liner as needed.	1. Septa 2. GC columns 3. Syringes
pH Meter	1. Daily calibration. 2. Replace electrodes as needed. 3. Spare electrodes	1. pH buffers 2. Batteries
Conductivity Meter	1. Daily calibration. 2. Check redline and replace batteries if does not calibrate.	1. Batteries
PID Meter	1. Daily calibration. 2. Recharge batteries daily. 3. Clean lamp as needed. 4. Clean ion chamber as needed. 5. Fan cleaning.	1. PID cleaning compound 2. Charges

FIGURES

WARZYN

Figure 2-1
Project Organization Chart
Remedial Investigation/Feasibility Study
Beloit Corporation, Rockton Facility